Iowa Department of Natural Resources
Environmental Protection Commission

ITEM **11** **DECISION**

TOPIC **Contract – Iowa State University – Intensive Lake Monitoring**

The Department requests Commission approval of a $167,005 contract with Dr. John Downing to conduct biological lake monitoring during the summer of 2007.

The purpose of this contract is to examine the biological quality of Iowa's lakes through the correlation of the lake biological data with significant breakpoints in water quality. Further, the contract will provide analyses discriminating lakes with water quality leading to good biotic ecosystem health from those with poorer ecological integrity. This will allow determination of reference conditions, or "least disturbed condition" in Iowa's natural vs. constructed lakes, shallow vs. deep lakes, and across lakes in the diverse geographical regions of the state (e.g., ecoregion or HUC6 watersheds). These data can then be used to evaluate the status and condition of Iowa lakes (Clean Water Act 305b/303d assessment) and can also be used to determine restoration goals and achievements for state priorities. This contract provides monitoring on 104 of Iowa's high quality, low quality and intermediate quality lakes for a variety of parameters including water chemistry, biological and limnological analyses.

Work Products include

- Full lake survey with all lakes comparable including 35 new lakes from the "B" list.
- Full profiles of several important chemical and physical parameters.
- Electronic data products linking physical, chemical and biological data.
- Formatting of data for STORET input or other database format.
- Analyses of comparative ecological integrity across the range of Iowa's lake ecosystems including biotic characteristics of the "least disturbed condition" often referred to as "reference condition" for natural and constructed lakes, shallow and deep lakes, and lakes across the geographic regions of Iowa.
- Discriminant analysis showing water quality variables impacting biotic water quality.
- Breakpoint analysis to determine criterion levels of water quality measures.
- ISU will provide reports in a web-based format.
- ISU will provide IDNR with 3 copies of the report in paper format each year, if desired.
- Reports will be made available in pdf format on the web.
- ISU will distribute paper copies of the reports to the community at a moderate cost.
- Data and information will be posted on the Iowa Lakes Information System in as near real-time as is practically possible.

Funding for this contract comes from the Environment First Infrastructure Funds – Water Quality Monitoring Funds.

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Environmental Services Division

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Analyzed Regularly from Mixing Zone Integrated Samples	**Depth Profiles Analyzed 3-times each Summer**
Chlorophyll (chemical)	Temperature
Phytoplankton Composition	Field pH
Zooplankton Composition	Dissolved O_2
Secchi Disk Transparency	Specific Conductivity
Total P	Turbidity
Dissolved P	
$NO_2 + NO_3$	
NH_4	
Unionized NH_3	
Total N	
Alkalinity	
Lab pH	
Dissolved Organic Carbon	
Microcystins	
Total Suspended Solids	
Inorganic Suspended Solids	
Volatile Suspended Solids	
Particle Size Distribution	

Chemical and physical	**Biotic**
Dissolved Oxygen % Saturation	Phytoplankton Taxonomic Richness
pH Deflection	Zooplankton Taxonomic Richness
TN :TP Ratio	Cyanobacterial Dominance
Carlson Trophic State Index	Dominance of other planktonic groups
Carbon Balance including role as sink or source of atmospheric CO_2	Large filter-feeder biomass
Percentile Rank for all relevant values, as compared to all other Iowa lakes	Numerical abundance of zooplankton for fisheries analyses
Hypsographic representation of profile data	
Average size of suspended particles	
Fractions of habitable area and volume from combined hypsography and oxygen profiles	

Twenty five lakes monitored in the 2000-2005 surveys that were of highest water quality according to discriminant analysis by ISU Limnology and DNR fisheries personnel.

Lake ID	Lake name	LakeType
003	Arrowhead Lake (Sac)	Surface mine
010	Big Spirit Lake	Natural
024	Crawford Creek Impoundment	Constructed
026	Dale Maffitt Reservoir	Constructed
033	East Okoboji Lake	Natural
038	George Wyth Lake	Constructed
039	Green Belt Lake	Constructed
040	Green Castle Lake	Constructed
050	Lacey Keosauqua Park Lake	Constructed
055	Lake Geode	Constructed
064	Lake Minnewashta	Natural
071	Lake Wapello	Constructed
073	Little Sioux Park Lake	Surface mine
086	Moorehead Park Pond	Constructed
087	Mormon Trail Lake	Constructed
088	Nelson Park Lake	Constructed
089	Nine Eagles Lake	Constructed
091	Oldham Lake	Constructed
095	Pleasant Creek Lake	Constructed
096	Poll Miller Park Lake	Constructed
109	Slip Bluff Lake	Constructed
116	Three Mile Lake	Constructed
125	West Okoboji Lake	Natural
129	Willow Lake	Constructed
132	Yellow Smoke Park Lake	Constructed

Twenty five lakes monitored in the 2000-2005 surveys that were of poorest water quality according to discriminant analysis by ISU Limnology and DNR fisheries personnel.

Lake ID	**Lake name**	**LakeType**
008	Beeds Lake	Constructed
013	Bob White Lake	Constructed
017	Carter Lake	Oxbow
023	Coralville Reservoir	Constructed
025	Crystal Lake	Natural
031	Don Williams Lake	Constructed
032	East Lake (Osceola)	Constructed
035	Eldred Sherwood Lake	Constructed
048	Ingham Lake	Natural
054	Lake Darling	Constructed
067	Lake Orient	Constructed
075	Little Wall Lake	Natural
076	Littlefield Lake	Constructed
079	Lower Pine Lake	Constructed
081	Mariposa Lake	Constructed
093	Ottumwa Central Park Ponds	Oxbow
100	Red Rock Reservoir	Constructed
104	Saylorville Reservoir	Constructed
107	Silver Lake (Delaware)	Constructed
108	Silver Lake (Palo Alto)	Natural
106	Silver Lake (Worth)	Natural
114	Swan Lake	Constructed
117	Trumbull Lake	Natural
118	Tuttle Lake	Natural
120	Union Grove Lake	Constructed
122	Upper Pine Lake	Constructed

Thirty six lakes monitored in the 2000-2005 surveys that were of intermediate water quality according to discriminant analysis by ISU Limnology and DNR fisheries personnel and were also either natural lakes, those of high socio-economic value (Downing et al. 2005), or those in IDNR's 35 priority lakes list (Table 5). Criteria for choices of intermediate water quality lakes are indicated by the color of the "X" in the last column. Natural lakes are indicated in blue, high value lakes are indicated in green, and the six additional lakes on the 35 priority lakes list, that would not have been chosen by other criteria, are shown in orange.

Lake ID	Lake name	Origin	Criterion
074	Little Spirit Lake	Natural	X
102	Rock Creek Lake	Constructed	X
105	Silver Lake (Dickinson)	Natural	X
011	Black Hawk Lake	Natural	X
113	Storm Lake	Natural	X
077	Lost Island Lake	Natural	X
036	Five Island Lake	Natural	X
021	Clear Lake	Natural	X
060	Lake Manawa	Oxbow	X
097	Prairie Rose Lake	Constructed	X
059	Lake Keomah	Constructed	X
001	Arbor Lake	Constructed	X
016	Brushy Creek Lake	Constructed	X
041	Green Valley Lake	Constructed	X
078	Lower Gar Lake	Natural	X
052	Lake Anita	Constructed	X
045	Hickory Grove Lake	Constructed	X
090	North Twin Lake	Natural	X
123	Viking Lake	Constructed	X
065	Lake of the Hills	Constructed	X
034	Easter Lake	Constructed	X
051	Lake Ahquabi	Constructed	X
029	Diamond Lake	Constructed	X
053	Lake Cornelia	Natural	X
009	Big Creek Lake	Constructed	X
019	Center Lake	Natural	X
020	Central Park Lake	Constructed	X
098	Rathbun Reservoir	Reservoir	X
012	Blue Lake	Oxbow	X
061	Lake Macbride	Constructed	X
121	Upper Gar Lake	Natural	X
049	Kent Park Lake	Constructed	X
043	Hannen Lake	Constructed	X
099	Red Haw Lake	Constructed	X
112	Springbrook Lake	Constructed	X

Thirty-five restoration priority lakes. Lakes were selected from among 127 significant public lakes in Iowa based on needs, use, potential use, and local support.

Lake name	**County**
Lake Manawa	Pottawattamie
Pleasant Creek Lake	Linn
Rock Creek Lake	Jasper
Lake Macbride	Johnson
George Wyth Lake	Black Hawk
Lake Ahquabi	Warren
Clear Lake	Cerro Gordo/Hancock
Brushy Creek Lake	Webster
Lake Geode	Henry
Lake Darling	Washington
Black Hawk Lake	Sac
Big Creek Lake	Polk
Green Valley Lake	Union
Blue Lake	Monona
Easter Lake	Polk
Central Park Lake	Jones
Prairie Rose Lake	Shelby
Lake Anita	Cass
Hickory Grove Lake	Story
Red Haw Lake	Lucas
Union Grove Lake	Tama
Lake of the Hills	Scott
Lake Keomah	Mahaska
Hannen Lake	Benton
Little Wall Lake	Hamilton
Kent Park Lake	Johnson
Diamond Lake	Poweshiek
Carter Lake	Pottawattamie
Arbor Lake	Poweshiek
Storm Lake	Buena Vista
Viking Lake	Montgomery
Five Island Lake	Palo Alto
Lower Gar Lake	Dickinson
Crystal Lake	Hancock
Silver Lake	Deleware

Forty lakes from the “B” list that are larger than 10 acres in area, have boat ramps, and meet other selection criteria indicated in the last three columns and in the workplan text.

DNR Lake Code	ISU Lake_ID	Name	County	Origin	Area (acres)	Map	Natural	>149 acres, pub. acc.
BAR36	204	Bartlett	Fremont	Surface mine	22	X		
BIN02	207	Binder	Adams	Constructed	78.8	X		
BHP81	208	Black Hawk Pits	Sac	Surface mine	22	X		
RRP77	210	Blue Heron	Polk	Surface mine	232			X
BLP17	211	Blue Pit	Cerro Gordo	Surface mine	14	X		
DEL28	218	Delhi	Delaware	Constructed	448			X
DIA30	219	Diamond (Dickinson)	Dickinson	Natural	98	X	X	
ELK21	220	Elk	Clay	Natural	261		X	X
FAF17	222	Fin and Feather	Cerro Gordo	Surface mine	10	X		
FUL65	225	Fulsom	Mills	Surface mine	45	X		
GIS49	227	Green Island	Jackson	Oxbow	600			X
GUS11	228	Gustafson	Buena Vista	Constructed	10	X		
HIG32	229	High	Emmet	Natural	467	X	X	X
INI10	231	Independence	Buchanan	Constructed	280			X
IPP35	233	Interstate Park Pond (Franklin)	Franklin	Surface mine	25	X		
IOW32	234	Iowa (Emmet)	Emmet	Natural	802	X	X	X
JOP67	235	Johnston Pit	Monona	Surface mine	12	X		
KEC65	236	Keg Creek	Mills	Surface mine	53	X		
LAY80	238	Loch Ayr	Ringgold	Constructed	78	X		
MOR99	242	Morse	Wright	Natural	98		X	
NAS19	243	Nashua	Chickasaw	Constructed	200			X
NEP11	244	Newell Pit	Buena Vista	Surface mine	15	X		
NOD01	245	Nodaway (Adair)	Adair	Constructed	25	X		
ODE58	246	Odessa	Louisa	Oxbow	3000			X
PER36	248	Percival	Fremont	Surface mine	20	X		
PIC11	249	Pickeral	Buena Vista	Natural	176	X	X	X
RIC95	253	Rice	Winnebago	Natural	1005	X	X	X
SAP67	255	Savery Pond	Monona	Constructed	11	X		
SBE97	257	Snyder Bend	Woodbury	Oxbow	400	X		X
SPR18	258	Spring (Cherokee)	Cherokee	Surface mine	18	X		
	262	Virgin	Palo Alto	Natural	213		X	
WSW32	265	West Swan	Emmet	Natural	1038		X	X